



# ICAO ENGINE nvPM EMISSIONS DATA SHEET

## SUBSONIC ENGINES

ENGINE IDENTIFICATION: CFM56-7B27E BYPASS RATIO (-): 5.1  
 UNIQUE ID NUMBER: 01P11CM121 PRESSURE RATIO  $\pi_{co}$  (-): 29.0  
 COMBUSTOR: Tech Insertion  
 ENGINE TYPE: TF RATED OUTPUT  $F_{co}$  (kN): 121.4

### REGULATORY DATA

| CHARACTERISTIC VALUES:                     | $LTO_{mass}/F_{co}$<br>(mg/kN) | $LTO_{num}/F_{co}$<br>(particles/kN) | NVPM MASS CONCENTRATION<br>( $\mu\text{g}/\text{m}^3$ ) |
|--------------------------------------------|--------------------------------|--------------------------------------|---------------------------------------------------------|
| LTO/ $F_{co}$ AND MAX nvPM <sub>mass</sub> | 116.0                          | 1.04E+15                             | 2301                                                    |
| AS % OF CAEP/10 LIMIT                      | -                              | -                                    | 38.3                                                    |
| AS % OF CAEP/11 LIMIT (InP)                | 5.7                            | 8.0                                  |                                                         |
| AS % OF CAEP/11 LIMIT (NT)                 | 28.2                           | 20.5                                 |                                                         |

### MEASURED DATA

| MODE                                                                                | POWER SETTING<br>(% $F_{co}$ ) | TIME<br>minutes | FUEL FLOW<br>kg/s | EMISSIONS INDICES*            |                                     | NVPM MASS CONCENTRATION<br>PEAK nvPM <sub>mass</sub><br>( $\mu\text{g}/\text{m}^3$ ) |
|-------------------------------------------------------------------------------------|--------------------------------|-----------------|-------------------|-------------------------------|-------------------------------------|--------------------------------------------------------------------------------------|
|                                                                                     |                                |                 |                   | EI <sub>mass</sub><br>(mg/kg) | EI <sub>num</sub><br>(particles/kg) |                                                                                      |
| TAKE-OFF                                                                            | 100                            | 0.7             | 1.293             | 70.8                          | 4.02E+14                            |                                                                                      |
| CLIMB OUT                                                                           | 85                             | 2.2             | 1.031             | 44.0                          | 4.33E+14                            |                                                                                      |
| APPROACH                                                                            | 30                             | 4.0             | 0.343             | 1.7                           | 7.10E+13                            |                                                                                      |
| IDLE                                                                                | 7                              | 26.0            | 0.110             | 0.7                           | 2.66E+13                            |                                                                                      |
| LTO TOTAL (kg, mg, number of particles)                                             |                                |                 | 445               | 10104                         | 9.12E+16                            | -                                                                                    |
| NUMBER OF ENGINES                                                                   |                                |                 |                   | 1                             | 1                                   | 1                                                                                    |
| NUMBER OF TESTS                                                                     |                                |                 |                   | 3                             | 3                                   | 3                                                                                    |
| AVERAGE LTO/ $F_{co}$ VALUES (mg/kN, particles/kN)                                  |                                |                 |                   | 83.2                          | 7.51E+14                            | -                                                                                    |
| MAX EI VALUES (mg/kg, particles/kg) AND MAX MASS CONC. ( $\mu\text{g}/\text{m}^3$ ) |                                |                 |                   | 70.8                          | 4.33E+14                            | 1788                                                                                 |

\* Emissions Indices are corrected for thermophoretic loss and fuel hydrogen content

### DATA FOR EMISSIONS INVENTORIES (ESTIMATIONS FOR ENGINE EXIT PLANE VALUES)

| MODE      | POWER SETTING<br>(% $F_{co}$ ) | CORRECTED EMISSIONS INDICES      |                                        |
|-----------|--------------------------------|----------------------------------|----------------------------------------|
|           |                                | EI <sub>mass_SL</sub><br>(mg/kg) | EI <sub>num_SL</sub><br>(particles/kg) |
| TAKE-OFF  | 100                            | 82.1                             | 1.01E+15                               |
| CLIMB OUT | 85                             | 53.2                             | 1.30E+15                               |
| APPROACH  | 30                             | 2.7                              | 3.98E+14                               |
| IDLE      | 7                              | 1.1                              | 1.34E+14                               |

### AMBIENT CONDITIONS

|                                | From   | To     | FUEL                          |       |
|--------------------------------|--------|--------|-------------------------------|-------|
| BAROMETER (kPa)                | 99.5   | 100.2  | HEAT OF COMBUSTION (MJ/kg)    | 43.27 |
| TEMPERATURE (K)                | 295.5  | 311.8  | HYDROGEN CONTENT (%mass)      | 13.83 |
| HUMIDITY (kg water/kg dry air) | 0.0066 | 0.0122 | AROMATICS CONTENT (%vol)      | 18.7  |
|                                |        |        | NAPHTHALENE CONTENT(%vol)     | 0.67  |
|                                |        |        | SULPHUR CONTENT (ppm by mass) | 519   |

MANUFACTURER: CFM International  
 TEST ORGANIZATION: Safran Aircraft Engines  
 TEST LOCATION: Villaroche, France  
 TEST DATES: 25/07/2019-30/07/2019

### REMARKS

- Engine 849-166/1
- Certification Report CR-2097/3 SUPPLEMENT 2-5B, CR-2097/3 SUPPLEMENT 2-7B